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Greener and selective synthesis of various aromatic amines by TiO_2 nanocatalyst under light irradiation

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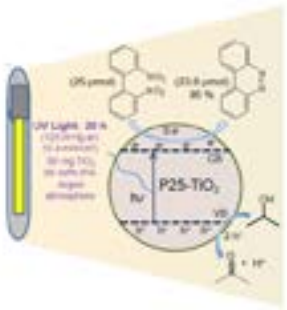
Photocatalytic reduction of nitro-aromatics to industrially important amino-derivatives using greener process attracted a great deal of research interest as compared to conventional synthetic techniques. In this context, this research will show some potential usage of different sizes and shapes of bare and metal loaded TiO_2, nanostructures (1-4) for the improved photoreduction efficiency of nitroaromatics under solar irradiation. It observed that anisotropic and core-shell nanostructures displaying superior catalysis and photocatalysis properties than conventional bulk catalysts materials. Photocatalytic reduction of 25 µmol 2, 2'-dinitrobiphenyl in 50% aqueous iso-propanol and 50 mg P25-TiO_2 under an argon atmosphere and 20 h UV light irradiation selectively produced 23.8 µmol of benzo [c] cinnoline (95%), (scheme 1) and 2, 2'-biphenyldiamine (5%) whose amount gradually increased with the irradiation time beyond 20–24 h due to further reduction of benzo [c] cinnoline. Selective photoreduction of mono/dinitro-benzene to nitroanline and diaminobenzene etc could be controlled by crystal phases and shapes of TiO_2 nanoparticles both under UV and solar irradiation. Highly sunlight photoactive Aloe-veral shaped crystalline rutile TiO_2 nanoarchitectures is found to have superior hydrogenation efficiency of different nitroaromatics than conventional P25 and rutile TiO_2 under direct sunlight exposure. Cu nanostructures of various shapes and sizes as superior catalysts for nitro-aromatic reduction and co-catalyst for Cu/TiO_2 photocatalysis. Likewise core shell and lenghty nanostructures of mono and bimetallic plasmonic nanocatalysts exhibited better selectivity and yield for nitroaromatices reduction.



Recent Publications

1. Kaur J, Pal B (2014) 100% selective yield of m-nitroaniline by rutile TiO_2 and m-phenylenediamine by P25-TiO_2 during m-dinitrobenzene photoreduction. Catal. Comm., 53, 25–28.
2. Kaur J, Pal B (2015) Selective formation of benzo [c] cinnoline by photocatalytic reduction of 2, 2'-dinitrobiphenyl using TiO_2 and under UV light irradiation. Chem. Commun., 51, 8500-8503.
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4. Singh, S, Prajapot, R.C., Rather, R. A and Pal B, Aloe-vera shaped rutile TiO_2 for selective hydrogenation of nitroaromatic under direct sun light irradiation, Arabian J. Chemistry, https://doi.org/10.1016/j.arabjc.2018.04.002. April 2018.